

Spring 2018

# Variables Related to Colon Cancer Screening Rates Among Male Veterans

Patricia D. Dotson, MSN, APRN  
*George Washington University*

Follow this and additional works at: [https://hsrc.himmelfarb.gwu.edu/son\\_dnp](https://hsrc.himmelfarb.gwu.edu/son_dnp)

 Part of the [Community Health and Preventive Medicine Commons](#), [Neoplasms Commons](#), and the [Nursing Commons](#)

---

## Recommended Citation

Dotson, MSN, APRN, P. D. (2018). Variables Related to Colon Cancer Screening Rates Among Male Veterans. , (). Retrieved from [https://hsrc.himmelfarb.gwu.edu/son\\_dnp/37](https://hsrc.himmelfarb.gwu.edu/son_dnp/37)

This DNP Project is brought to you for free and open access by the Nursing at Health Sciences Research Commons. It has been accepted for inclusion in Doctor of Nursing Practice Projects by an authorized administrator of Health Sciences Research Commons. For more information, please contact [hsrc@gwu.edu](mailto:hsrc@gwu.edu).

Variables Related to Colon Cancer Screening Among Male

Veterans and Non-Veterans

Patricia D. Dotson, MSN, APRN

The George Washington University

In partial fulfillment of the requirements for the degree of Doctor of Nursing Practice

DNP Project Team

Qiuping Zhou, PhD, RN

Kathleen Griffith, PhD, RN

Spring, 2018

## Abstract

**Background/Problem:** The Center for Disease Control & Prevention (CDC) recommends colon cancer screening colonoscopy beginning at age 50 years and every 10 years thereafter. The purpose of this study was to compare differences in meeting the colorectal cancer (CRC) screening recommendations between male Veterans and non-Veterans and identifying any association among Veterans social economic status (SES).

**Methods:** A descriptive-comparative design was used to address the study question, aims and hypotheses, using the 2014 Behavioral Risk Factor Surveillance System (BRFSS) data. A national representative sample of 20,360 Veterans and 36,183 non-Veterans between 50-74 years, were included in analysis. The associations between meeting the CRC screening recommendations among Veterans and their race/ethnicity, income, educational level and marital status were also analyzed. Chi-Square tests were used to study the relationships between dependent and independent variables.

**Results:** Veterans were more likely than non-Veterans to have received the recommended CRC screening in specified time intervals (76.5% vs. 64.6%;  $\chi^2=1176.66$ ,  $p<0.001$ ). There were significant differences in CRC screening rates among ethnic/racial groups with white at 70.1%, Blacks at 68.3%, and Hispanics at 62.0%,  $\chi^2=23.93$ ,  $p<0.001$ . Veterans who were younger than 65 years, had less education (lower than high school), lower income (<35K), and not married reported lower rates of meeting CRC screening recommendations than their counterparts ( $p<0.001$  for all comparisons).

**Conclusions:** Male Veterans had a higher rate of meeting CRC screening recommendations than non-Veterans and socioeconomics were significant factors. Evidence generated from study can be used to design targeted strategies to improve CRC screening among Veterans.

## **Variables Related to Colon Cancer Screening Among Male Veterans and Non-Veterans**

### **BACKGROUND/SIGNIFICANCE**

Colon cancer is a major health concern and public health problem in the United States (U.S.) despite the availability of screening methods for early detection of this disease. Colorectal cancer (CRC) is the third most common cancer and the fourth leading cause of cancer deaths worldwide (Agency for Healthcare Research and Quality (AHRQ), 2013; Center for Disease Control & Prevention Colon Cancer (CDC), 2014). In 2014, about 1.6 million people were projected to be diagnosed with cancer in the United States (BRFSS, 2014).

CRC has been identified by the CDC as a preventable cancer when colonoscopy screening is performed at recommended intervals. This population-based screening test was developed and implemented with the goal of primary prevention of colorectal cancer. In previous research, gender, age, race, ethnicity, marital status, insurance and income have been associated with CRC screening rates according to recommended CDC guidelines (Wallace & Suzuki, 2012; Zullig, Carpenter et al., 2013). However, the literature lacked information about associations between these demographic variables and CRC screening rates among male Veterans when compared to the general population (Baber, 2014; Zubero et al., 2014). This project sought to examine variables that relate to male Veterans behaviors in following CDC recommended guidelines for CRC screening beginning at age 50 years.

CRC screening is important for cancer prevention. Data provided by the CDC suggested CRC screening performed according to recommendations, provides an accurate measure for early diagnosis, thereby lowering the chance of getting cancer (CDC, 2014). When CRC is found and treated early (stage 1), the chances of full recovery is 92%, according to the SEER database, which looked at individual's 5-year survival rate when diagnosed with colon cancer (National

Cancer Institute SEER, 2012; [www.cancercenter.org](http://www.cancercenter.org)). Conversely, the survival rate for stage IV metastatic disease has a 5-year survival rate of 11% (CDC, 2014; MMWR, 2011; National Cancer Institute SEER, 2012). The CDC recommends screening colonoscopy beginning at age 50 years (45 for African-Americans), and every 10 years thereafter. The United States Preventive Services Task Force (USPSTF) also recommends a colonoscopy screening every 10 years, but also recommends FOBT annually or sigmoidoscopy every 5 years, for early detection of CRC. Overall, colonoscopy screening helps with early detection and decreases CRC incidence and mortality rates (American College of Gastroenterology (ACG), 2016; CDC colorectal cancer, 2014; Healthy People 2020; National Cancer Institute SEER, 2012). Although the Veteran Affairs (VA) has an electronic reminder system in place for primary care physicians to generate request for routine recommended CRC screening, the screening rates have been reported as being lower than mammography breast cancer screening (Chao et al., 2009). Few studies were conducted that identified Veterans CRC screening rates and potential reasons for delayed or lack of preventative CRC screening. In a study conducted by Oberoi et al. (2014), reasons for procrastination included fear of a cancer diagnosis, self-medication and belief that they were too young to get cancer.

Chao et al. (2009) looked at the impact of insurance on CRC screening rates and considered age, gender and race. There were some identified barriers to care access based on individual insurance availability. However, there was no indication of how decisions to have a colonoscopy were impacted when comparing race/ethnicity, income, educational level or marital status. Investigation of these variables in relationship to CRC screening may generate valuable information that guides clinicians within the VA in how they approach management of this chronic disease and improve colonoscopy screening rates for disease prevention. Examining

CRC screening rates of male Veteran population may provide insight into best practices and improved prevention strategies.

Reports and studies conducted since colon cancer was discovered show several associated risk factors for the disease, including higher risk for males, African Americans and individual's living in more industrialized nations (CDC, 2014; Healthy People 2020). Thus, it is important to identify variables that are associated with CRC screening in the male population (CDC, 2014).

### **PROBLEM STATEMENT/PURPOSE**

Although Veterans generally have access to care at a VA facility, no current research identified the relationship of CRC screening in male Veterans and any association to race/ethnicity, income, educational level and marital status or identifying differences in CRC screening of U.S. male Veterans and non-Veterans, aged 50-74 years. Analysis of data can identify the variables that relate to CRC screening and propose strategies to increase screening rates among Veterans and decrease mortality related to a lack of screening and/or failure to complete timely screenings.

### **Purpose**

The purpose of this study was to explore associations of selected variables with male Veterans CRC screening and to compare Veterans and non-Veterans in meeting the recommended guidelines for CRC screening. The following research question, aims and hypotheses were addressed in this study:

### **RESEARCH QUESTION/AIMS**

What is the association of CRC screening rates among male Veterans and non-Veterans?

**SPECIFIC AIMS**

1. Assess differences in CRC screening rates between male Veterans and non-Veterans by age, between 50-74 years.
2. Assess differences in CRC screening rates of male Veterans by race/ethnicity.
3. Assess differences in CRC screening rates of male Veterans by income.
4. Assess differences in CRC screening rates of male Veterans by educational level.
5. Assess differences in CRC screening rates of male Veterans by marital status.

**RESEARCH HYPOTHESES**

Among Veterans aged 50-74 years,

1. There is a difference in the rate of meeting CRC screening test recommendations among three racial/ethnic groups: non-Hispanic white (white), non-Hispanic Black (African-Americans), and Hispanics.
2. There is a difference in the rate of meeting CRC screening test recommendations between Veterans who reported less than \$35,000 annual family income and those who reported higher than \$35,000.
3. There is a difference in the rate of meeting CRC screening test recommendations between Veterans with high school education or lower and those who received some college or higher.
4. There is a difference in the rate of meeting CRC screening test recommendations between Veterans who were married or living with a partner and those who were single.
5. There is a difference in the rate of meeting the CRC screening test recommendations between Veterans and non-Veterans.

Identifying causes associated with low CRC screening rates may lead to development of targeted interventions or strategies to improve adherence to recommended screening guidelines for male Veterans and prevention of colorectal cancer.

### **LITERATURE REVIEW/THEORY**

The Behavioral Risk Factor Surveillance System (BRFSS) identified several increased risk factors related to developing colorectal cancer. Individuals who are greater than age 50 years, consume excessive alcohol, have a positive family history of CRC, smokers, or those with multiple medical comorbidities, such as diabetes or obesity, were identified (ACS, 2014; CDC, 2014).

A colonoscopy is considered as the best approach for finding and removing any rectal polyps and is considered the gold standard diagnostic test for CRC screening (MMWR, 2011; National Cancer Institute SEER, 2012). Colonoscopy screening examination test allows the physician to view the entire colon and rectum. The sensitivity and specificity of this colon screening test exceeds all other related diagnostic test available (National Cancer Institute, 2012). In addition to colonoscopy, there have been several other tests available to help in the early detection of CRC. Although not as accurate or comprehensive, some common, less invasive screening tests include rectal examination, stool examination for blood (gFOBT, FIT, flexible sigmoidoscopy, Cologuard), virtual colonoscopy and barium enema.

Chao et al. (2009) conducted a study investigating how CRC screening and care in the VA could be improved. Poor outcomes and lower survival rates for CRC were attributed to delayed diagnosis and less access to treatment in Veterans (CDC, 2014). Chao's study reviewed numerous aspects of CRC care in the VA that was being monitored for quality improvement. CRC prevention was one of the identified quality improvement outcome measures. The



Department of Veteran Affairs (VA) manages the largest integrated health care system in the U.S. There are 144 hospitals and 1,221 outpatient sites (Department of Veteran Affairs, 2016). Approximately 5.5 million Veterans received care in the VA in 2008 (Chao et al., 2009). This number has increased to 8.97 million in 2016 (Department of Veteran Affairs, 2016). VA has been reported as providing care to approximately 3% of all U.S. patients diagnosed with cancer (Zullig, Jackson et al., 2013). VA prides itself on being a leader in adhering to guidelines based on evidenced based practices (Zullig, Jackson et al., 2013).

Survival rates are outcome measures of quality when looking at patterns of CRC screening for prevention versus the lack of screening and development of colon cancer requiring secondary and tertiary levels of care. Addressing prevention strategies which target this population ultimately save lives, reduces patient & family emotional stress and reduces healthcare costs (CDC, 2014; Healthy People 2020).

The literature showed gaps in how African-Americans access quality care within the VA system. African-Americans have a lower percentage rate when seeking preventative care and screenings (May et al.; Zullig et al., 2013). Brounts et al. (2009) conducted a study focused on the Military Healthcare System examining CRC screening among various racial and ethnic groups and comparing for any overall differences among the different racial and ethnic groups. The study aim reported was to identify screening prevalence within selected Department of Defense (DOD) beneficiaries with equal access to care (Brounts et al., 2009). The researchers found that of the 17,252 patients who met their inclusion criteria, ethnicity data were only available in 62% of the study population. They noted that the screening rates for CRC were high overall (71%) but did not demonstrate equal access to care among the different ethnic groups (Caucasian 73.2%, Hispanic 68.1%, African-American 69.8%). However, the researchers

reported that colonoscopy was the most frequently used modality of all the racial groups. They observed a slightly higher rate of screening among males age 65 years and older and Caucasians. Based on the American Gastroenterological Association (AGA) screening guidelines, Brounts et al. (2009) reported 12,229 patients in their study were identified as being up to date with recommended screening. In another study comparing colorectal screening examination between Caucasians and non-white minorities, the authors reported that the odds ratio of receiving recommended screening was .5 for all non-white minorities (Wallace & Suzuki, 2012).

Other studies have shown that African-American patients systematically receive lower quality healthcare than white patients, which influences their decision to have the recommended CRC screening (CDC, 2014; National Cancer Institute, 2014). Two studies conducted by Zullig and colleagues suggest that when Veterans are provided with equal access to care, the outcomes can be comparable between whites and African-Americans (Zullig, Carpenter et al., 2013; Zullig, Jackson et al., 2013). In one study conducted by Zullig, Jackson et al. (2013), racial differences were examined which looked at processes (time to treatment and outcomes survival rates) of Veterans who had received CRC screening at one of their facilities. Of the 2022 patients who met inclusion criteria, only data for white and African-American male patients was analyzed. Most patients lived in the Southern region of the United States, were married and Caucasian. They found no racial disparities in their study results. However, other researchers suggested that race may be an influencing variable in CRC screening among Veterans (May et al., 2014). May et al., 2014, reported in their analysis, racial differences for 1 process measure of receipt of surveillance colonoscopy but suggested that these differences were insignificant in impacting quality care. Among those receiving colonoscopy examinations within 7 to 18 months after

surgery, it was reported that white patients had shorter median times than blacks when obtaining a surveillance colonoscopy.

Baxter, Goldwasser, Paszat et al. (2009) found in their population-based, case control study of 18,816 patients, designed to evaluate the association between colonoscopy and CRC deaths, that a colonoscopy was promoted for screening and prevention of CRC, but they reported that randomized trials supporting the benefit of this practice were not available.

### **Theory**

The theory used to guide the development of this study was the Health Belief Model (HBM) (scholar.google.com). It was originally developed in the 1950s to explain why medical screening programs offered by the U.S. public health departments were not successful. This theory has been used to study screening programs for diseases and it examines the perception of a disease process and how an individual may act upon it. Health behaviors have been described as activities performed by individuals that influence one's total being; emotional, mental, physical, psychological and spiritual being. The HBM is an appropriate model for this study since the BRFSS utilizes subjective data from individuals describing their beliefs and perceptions about colon cancer screening practices.

As the HBM was applied to this study, it was expected that CRC screening rates among male Veterans and timely completion of screening, to be related to race/ethnicity, income, educational level and marital status. The four HBM constructs have been shown to predict CRC screening behavior. According to Early & Gray (2014) and Wallace & Suzuki (2012), health behaviors are determined by personal beliefs or perceptions about a disease and the strategies which can decrease incidences.

In application of the HBM to this study of CRC screening rates, there are four perceptions that serve as main constructs of the model relating to study variables. Each perception may be used either individually or in combination to provide an explanation for health behaviors, to include cues to action, motivating factors and self-efficacy (Larkey, 2015; Wallace & Suzuki, 2012). The first construct, perceived seriousness, addressed one's individual belief about the severity of a disease. If an individual does not have basic knowledge about the seriousness of colon cancer, then they may choose not to have any type of CRC screening. The BRFSS survey provides data which compares Veteran and non-Veterans decision to have CRC screening in the time period recommended by CDC guidelines. The second construct, perceived susceptibility, reflects how individual's views a personal risk. Perceived susceptibility is reported as being a powerful motivator for health behavior change or avoidance of unhealthy behaviors. For example, if a Veteran perceives a threat of developing colon cancer if they are not screened, they may be more likely to follow the recommended CDC guidelines for CRC screening to avoid the disease. The American Colon Society (2014) reports the cancer rate of survival from colon cancer is exponentially higher at 92%, if diagnosed at stage 1 versus 11% at stage IV. The third construct, perceived benefits, is an individual's opinion about whether a behavior change, or new behavior would be valuable to them. Chao et al. (2009) study suggest CRC screening and care in the VA could be improved and that the poor outcomes and lower survival rates for CRC were attributed to delayed diagnosis and less access to treatment in Veterans (CDC, 2014). These factors can be considered in support of recommendations specific for the male Veteran population. The fourth construct, perceived barrier, looks at an individual's reluctance to change. To overcome any individual barriers, it was helpful for the other constructs of perceived benefits, perceived seriousness and perceived susceptibility to be embraced as being more

important to direct health behavior change versus being driven by perceived barriers. For example, if an individual does not think he is at risk for catching a disease because “too young”, suggests denial of reality.

### **Identifying & Defining Study Variables**

Although Veterans generally have access to care at VA facilities, research can identify if any disparities, barriers or relationships exist in rates of CRC screening for males between ages 50-74 years, when comparing race/ethnicity, income, educational level, and marital status. There was a gap in the research studying male Veterans and how they choose to have a screening colorectal exam when influenced by identified variables (race/ethnicity, income, educational level and marital status). The primary outcome variable in this study is meeting CRC screening recommendations (yes or no). Other variables examined included age (50-64 versus 65-74 years), race/ethnicity (white, African American, Hispanic), income (<35000 versus ≥35,000), education level (high school or lower versus some college or higher), and marital status (married/living with a partner versus single). Table 1 provides a listing of the study variables, operational and theoretical definitions.

## **METHODS**

### **Research Design**

A descriptive-comparative secondary data analysis design was used to address the research question and hypotheses. Specifically, were there any significant difference of rate of CRC screening between male Veterans and non-Veterans? Among male Veterans, were there associations between CRC screening and the following variables: race/ethnicity, income, educational level and marital status. The 2014 Behavioral Risk Factor Surveillance System (BRFSS) data was used for analysis. BRFSS provides retrospective secondary data which

include standardized State specific data on risk behaviors and identified prevention screening practices that can be related to chronic diseases, such as colorectal cancer, as well as other diseases that are considered preventable (BRFSS, 2016). All participants in the BRFSS received equal opportunity to be selected and the study is also cost effective as no costs of data collection were incurred for this analysis.

### **Study Populations/Sample**

The sample for this study included male Veterans and non-Veterans who participated in the 2014 data collection by the BRFSS. There were no interventions. BRFSS data were deidentified secondary data. This study inclusion criteria included males aged 50-74 years who were self-reported as African-American, white, or Hispanic.

Since 2011 it is reported that BRFSS surveys have been conducted using both telephone land lines and mobile phones. BRFSS conducts these surveys annually by selecting random adult households in the 50 states, Puerto Rico, Guam, and the US Virgin Islands (BRFSS, 2016). It was noted that those adults who participated in the surveys by cell phone, must reside in private residential housing. For this analysis, the Creative Research Systems (2012) sample size calculator was used to project the project sample size. With power of 0.8, alpha of 0.05, assuming a screening rate of 70% for Veterans and 65% for non-Veterans, we need 4,268 participants. The 2014 BEFSS included over 90,909 cases and that is adequate for our study.

### **Setting**

The BRFSS data were collected at the participants' home. The BRFSS collaborates with the Center for Disease Control and Prevention (CDC) in administration of these monthly phone interview surveys in which data was summarized and reported annually. State health

departments or contract personnel, all used the approved protocol guidelines for collecting data which was then transmitted to the CDC.

### **Instrumentation/Measurements**

The BRFSS questionnaire was used to collect data. The BRFSS has been collecting telephone interview data on health risk behaviors, chronic diseases, health promotion and disease prevention since 1984; the validity and reliability have both been tested by local, state and federal agencies. The BRFSS has been completed by more than 400,000 random phone interviews with adults living in the 50 United States, on an annual basis. Although reliability is not an absolute measurement, the BRFSS is assumed to have internal consistency of results based on the consistency of results over a period (BRFSS, 2016). The same repeated measuring procedures were used in collecting data for each BRFSS module.

Survey questions were scripted for the interviewers to standardize the procedure for data collection (BRFSS, 2016). The validity and reliability of extracted data may vary with coder expertise. Inter-rater reliability testing was not practical in conducting surveys of individual households, but mail follow-up surveys have been conducted which concluded parallel information (BRFSS, 2016; Hu, Pierannunzi & Balluz, 2011). Pierannunzi & Balluz (2013) conducted a study looking at limitations of the BRFSS and reported that retrospective BRFSS landline data are reliable and valid as measured against other surveys.

The BRFSS data are de-identified and in public domain. In this study, information was extracted from BRFSS data. The independent variables included race/ethnicity, income, educational level and marital status. The dependent variable was defined as meeting or not meeting the recommended CRC screening guidelines by USPSTF. Respondents aged 50-75 were considered as fully met the USPSTF recommendations if he had received one or more of

the recommended CRC tests within the recommended time interval: 1) have had a blood stool test within the past year; 2) have had a blood stool test within the past 3 years and a sigmoidoscopy within the past 5 years; 3) have had a colonoscopy in the past 10 years.

Theoretical and operational definitions, as well as variables definitions, are included in Table 1.

### **Data Collection Procedures**

Data was extracted from the 2014 BRFSS. The BRFSS was practical for this study objectives and because it a secondary data analysis, using de-identified public data, it did not require Institutional Review Board (IRB) approval. It was also cost effective as the data was already available for use.

### **Data Analysis Plan**

SPSS 24 was used to analyze the BRFSS 2014 data to answer the question and address the research hypotheses. Descriptive statistics were performed to report the frequencies and percentages of study variables. Chi-Square testing was used to analyze for relationships between the dependent variable (meeting CRC screening recommendations) and independent variables (race/ethnicity, income, educational level and marital status). For all analyses, alpha was set at 0.05.

### **ETHICAL CONSIDERATIONS**

There was no identifiable personal information of BRFSS survey participants included in the data set. GW IRB determined that this study was not considered as human subject research.

### **RESULTS**

First, the inclusion criteria were applied to select the sample. Participants were selected who were 1) males, 2) 50-74 years old and 3) were African-American, white or Hispanic. There were 192,970 males in the 2014 BRFSS dataset; among them, 98,342 were 50-74 years old. There



were 91,093 who were either AA, white or Hispanic. Among those, 32.2% were Veterans (N=29,231).

Table 2 shows the comparison between Veterans and non-Veterans on meeting CRC screening recommendations. Among Veterans, 76.5% met the CRC screening recommendations while for non-Veterans, 64.6% met the recommendation;  $\chi^2 = 1176.66$ ,  $p < 0.0001$ .

**Table 2** Veterans versus non-Veterans and rate of meeting CRC screening recommendations

	“Received recommended CRC tests in time interval”	“Did not receive CRC tests as recommended”	Total
Veterans	20,360 (76.5%)	6,270 (23.55)	26,630
Not Veterans	36,183 (64.6%)	19,840 (35.4%)	56,023
Total	56,543 (68.4%)	26,110 (31.6%)	100.0%

$\chi^2 = 1176.66$ ,  $p < 0.001$ ; Phi=0.12 (small effect size)

Descriptive statistics and frequency distributions for study variables among Veterans are shown in Table 3. Fifty-nine percent of the Veterans were 65 to 74 years of age. Eighty-nine percent of the Veterans were whites, 7.1% were blacks, and 3.6% were Hispanics. Most respondents (66.4%) had annual household income equal or greater than \$35,000. A majority of respondents (96%) had at least a high school education and 67% were married or living with a partner.

**Table 3** Variables associated with CRC screening among male Veterans

Variables	Total (n, %)	Meeting Colorectal Screening Recommendation		$\chi^2$	p
		Yes	No		
Age (years)					
• 50-64 years	11,947 (40.9)	34 (68.9)	3405 (31.1)	592.91	< .001
• 65-74 years	17,284 (59.1)	12,826 (74.2)	2865 (16.6)		
Race/ethnicity				23.93	< .001
• White	26,095 (89.3)	18,284 (70.1)	5594 (21.4)		
• Black	2084 (7.1)	1424 (68.3)	398 (19.1)		
• Hispanic	1052 (3.6)	652 (62.0)	278 (26.4)		
Income				529.55	< .001

• Less than \$35,000	4770 (16.3)	3165 (59.8)	1605 (30.3)		
• >= \$35000	19,418 (66.4)	15344 (73.5)	4074 (19.5)		
Education				300.20	< .001
• Less than High school/GED	1076 (3.68)	596 (55.4)	358 (33.3)		
• >=High school	28,057 (96.0)	19739 (70.4)	5903(21.0)		
Marital status				375.63	< .001
• Married/living with a partner	19580 (67.0)	14347 (73.3)	3592 (18.3)		
• Not married	9,552(32.7)	5,969 (62.5)	2,656 (27.8)		

Older age was related to a higher rate of meeting CRC screening recommendations. For Veterans aged 50-64 years, 68.9% met the recommendations; for those aged 65-74 years, 74.2% met the recommendation,  $\chi^2=592.91$ ,  $p<0.001$ . For race/ethnicity, 70.1% of whites, 68.3% of Blacks and 62% of Hispanics met the CRC screening recommendations. This difference in screening rate was statistically significant,  $\chi^2=23.93$ ,  $p<0.001$ . Higher income was associated with higher screening rate; for Veterans with annual household income of 35K or higher, the CRC screening rate was 73.5%; for those with annual income lower than 35K, the screening rate was 59.8%,  $\chi^2=529.55$ ,  $p<0.001$ . Similar to income, higher education was related to higher screening rate. For Veterans with high school education or higher, the screening rate was 70.4%; for Veterans with less than high school education, the screening rate was 55.4%,  $\chi^2=300.20$ ,  $p<0.001$ . For marital status, Veterans who were married or having a partner, reported a screening rate of 73.3%, while those who were single had a screening rate of 62.5%. This difference was significant,  $\chi^2=375.63$ ,  $p<0.001$ .

## DISCUSSION

This research is the first to identify influencing socioeconomic factors related to male Veterans CRC screening rates at intervals recommended by the CDC. These study findings

confirmed an expected relationship between Veteran CRC screening and race/ethnicity, income, educational level and marital status. The findings also provide support that Veterans are more likely to have met the CRC screening recommendations than non-Veterans. CRC screening rates were lower in Veterans who were younger, with less than high school education, lower income, and not married. Our findings were consistent with the literature in that gender, age, race, ethnicity, marital status, insurance and income were associated with CRC screening rates (Wallace & Suzuki, 2012; Zullig, Carpenter et al., 2013).

The rate of meeting CRC screening recommendations was highest among white (70.1%), followed by blacks (68.3%) and was the lowest among Hispanics (62%). However, the literature suggests a higher risk for CRC among male African-Americans (CDC, 2014; Healthy People 2020). Consideration should be given to future research evaluating efficacy of initial CRC screening among African-American beginning at age 45 years as recommended by CDC. In this study, the sample included a total of 7.1% Black and 3.6 Hispanic population while 89.3% included were white. This racial delineation is consistent with the 2016 race/ethnicity data reported by ACS, white with largest percentage (78.9%) and the next highest reported being African-American (10.6%) followed by Hispanic (6.7%). In the U.S., the benefits of early detection from screening for CRC are not shared equally among poor and minority populations, resulting in unnecessary deaths for those without access to screening (ACS, 2014).

Targeting prevention strategies focused on increased awareness and screening for this population can save lives from colorectal cancer. Consideration of health literacy and cultural norms that impact an individual's level of understanding might be helpful if included in education on awareness and prevention of disease by timely screening.

In a previous study, reasons for procrastination and delayed CRC screening included fear of a cancer diagnosis, self-medication and belief that they were too young to get cancer (Oberoi et al., 2014). Veterans understanding of the importance of a colonoscopy in CRC prevention is essential to empower the Veteran and increase individual's insight.

While the literature identified some barriers to care access for Veterans and non-Veterans based on individual insurance availability, there was no indication of how male Veterans who chose to have a colonoscopy were impacted when comparing race/ethnicity, income, educational level or marital status. Chao et al. (2009) looked at the impact of insurance on CRC screening rates and considered age, gender and race. However, as mentioned earlier, the authors found there were some identified barriers to care access based on individual insurance availability. The literature lacks information about CRC screening rates among male Veterans when compared to the general population (Baber, 2014; Zubero et al., 2014). Our study filled this gap by providing evidence that supports male Veterans were more likely to have met the CRC screening recommendations than their non-Veteran counterpart.

The HBM has been used previously to study screening programs for other diseases, but without supporting research, it is unclear if a Veteran describing their beliefs and perceptions about colon cancer screening practices may have any impact on their decision to receive CRC screening. This model was appropriate for this study since the BRFSS utilized subjective data from individuals describing their beliefs and perceptions about colon cancer screening practices. Accurate data and related information are essential to healthcare clinicians when developing prevention strategies based on Veterans unique needs. National organizations have published guidelines for CRC screening to include the CDC, Healthy People 2020 and the American

Cancer Society (ACS). There is consensus in the literature that CRC screening should be based on a colonoscopy.

There was a lack of evidence in the data to conclude if sample participants had any prior education or knowledge regarding CRC screening recommendations and different types of screening. Study results suggest that implementation of strategies incorporating education that could positively impact a Veteran's health beliefs and decision/behaviors regarding CRC screening, may lead to positive health outcomes. Prevention strategies by clinicians, aimed at targeted and tailored education, empowerment and active engagement of Veterans, are highly recommended. Published data of randomized controlled trials evaluating the efficacy of male Veteran CRC screening was missing. However, the literature supports colonoscopy as the screening test of choice; the gold standard.

### **STUDY LIMITATIONS**

There were several limitations with this study. One major limitation was the data collection method. Because the sample population self-reported information collected by different phone survey interviewers, the possibility of under/overestimating or giving an answer they thought 'desirable' exists. Another limitation was that the study only looked at male Veterans. Prior to 1975 females did not enter active duty forces in large numbers. Female Veterans were not included, as their demographic characteristics are different from male Veterans, and they represent a smaller percentage of Veterans receiving healthcare from the VA hospital. According to the CDC (2014), males have a lower percentage of CRC screening when compared to females, which influenced decision to focus on male gender in this study.

It is unknown if the BRFSS missing data for Veteran income level would have changed data analysis for this variable. Lastly, generalizability was limited to the male Veteran population,

but may be useful for others interested in comparing identified variables to non-Veterans.

Generalizability of study findings also was decreased as the BRFSS was the only site where data obtained.

### **IMPLICATIONS/RECOMMENDATIONS**

CRC screening can reduce morbidity and mortality by up to 60% for male Veterans 50 years and older, if they are screened regularly (Vet pop 2016). Prevention and early diagnosis and treatment, when appropriate, will reduce the long-term burden of this disease. Replication of this study in female Veterans is important because of the growing population of female Veterans, although they have been reported as minorities (Vet pop 2016). Vet pop 2016 reports an estimated 1.8 million of the 20.8 million living Veterans are women.

There was no literature found to indicate how male Veterans make decisions to have a cancer screening colonoscopy or how their decisions were impacted when comparing race/ethnicity, income, educational level or marital status. Further investigation of these variables in relationship to CRC may generate significant information that guides clinicians within the VA in how they approach improving colonoscopy screening rates for prevention of disease among male Veterans. Implementation of a tailored educational awareness program should be considered which integrates Veterans who are younger, with less than high school education, lower income (<35K), and not married, as study results suggest these groups had lower CRC screening rates.

### **CONCLUSION**

This study supports the hypotheses suggesting that among male Veterans aged 50-74 years, there is a difference in the rate of meeting the CRC screening test recommendations between Veterans and non-Veterans. Study results showed a significant association between male Veterans CRC rates, according to CDC recommendations, when compared to age, race/ethnicity,

income, education and marital status. Positive health outcomes from timely CRC screening at recommended intervals supports the CDC, Healthy People 2020, ACS and overall improved quality of life.

Despite limitations, this study contributes to a better understanding of influencing factors which relate to male Veterans completion of CRC screening. Changes in Veterans health practices can generate positive outcomes. Clinician implementation of appropriate learning level information, structured education program and teaching strategies regarding the importance of CRC screening recommendations, can influence Veterans perceptions of care and decision to accept recommended screening. VA hospital clinicians involved in the preventive screening assessment and monitoring of Veterans, should increase their focused efforts on reaching those Veterans who are not married, have less than high school/GED, or earn less than \$35,000/year, as these variables were shown to have a significant association in how Veterans make decision to complete timely recommended CRC screening.

## References

- Agency for Healthcare Research and Quality (AHRQ). National Quality Measures Clearinghouse. (2013). *Measure summary*. Retrieved from <http://www.qualitymeasures.ahrq.gov/content.aspx?id=46827#>
- American Cancer Society. (2014). *Colorectal Cancer Facts & Figures 2014-2016*. Retrieved from <http://www.cancer.org>
- American College of Gastroenterology (ACG). (2016). Colorectal cancer screening. Retrieved from <http://gi.org/guideline/colorectal-cancer-screening/>
- Baber, J., Anusionwu, C., Nanavaty, N., & Agrawal, S. (2014). Anatomical distribution of colorectal cancer in a veterans affairs medical center. *Southern Medical Journal*, 107(7), 443-447.
- Baxter, N.N., Goldwasser, M.A., Paszat, L.F., Saskin, R., Urbach, D.R., Rabeneck, L. Association of colonoscopy and death from colorectal cancer (2009) *Annals of Internal Medicine*, 150 (1), pp. 1-8.
- Brounts, L. R., Lehmann, R. K., Lesperance, K. E., Brown, T. A., & Steele, S. R. (2009). Improved rates of colorectal cancer screening in an equal access population. *American Journal of Surgery*, 197(5), 609-613.
- CDC. Vital Signs: colorectal cancer screening, incidence, and mortality—United States, 2002-2010. *MMWR* 2011;60:884-889.
- Centers for Disease Control and Prevention (CDC). (2014). *Behavioral risk factor surveillance system (BRFSS)*. Retrieved from <http://www.cdc.gov/brfss/>
- Centers for Disease Control and Prevention (CDC). (2016). *Behavioral risk factor surveillance system (BRFSS)*. Retrieved from <http://www.cdc.gov/brfss/Centers for Disease Control and>



- Prevention. (2014). Colorectal (colon) cancer. Retrieved from <http://www.cdc.gov/cancer/colorectal/statistics/>
- Centers for Disease Control and Prevention. Vital signs: Colorectal screening incidence and mortality—United States, 2002-2010. *MMWR* 2011; 60, 884-889.
- Chao, H. (2009). Improving colorectal cancer screening and care in the veterans affairs Healthcare system. *Clinical Colorectal Cancer*, 8(1), 22-28.
- Colorectal Cancer Statistics-Know the Numbers. Retrieved from [www.cancercenter.org](http://www.cancercenter.org)
- Creative Research Systems. (2012). Sample size calculator [Data file]. Retrieved from <http://www.surveysystem.com/sscalc.htm>
- Early, D & Gray, D. (2014). Patient attitudes and issues in colon cancer screening. *JNCCN*. 12:673-678.
- Health Belief Model: Major Concepts: Theories and Approaches. Retrieved from [scholar.google.com](http://scholar.google.com)
- Hu SS, Pierannunzi C, Balluz L. Integrating a multimode design into a national random-digit-dialed telephone survey. *Prev Chronic Dis* 2011; 8(6): A145. Larkey LK, McClain D, Roe DJ, May, F. P., Bromley, E. G., Reid, M. W., Baek, M., Yoon, J., Cohen, E., . . . Spiegel, B. M. R. (2014). Low uptake of colorectal cancer screening among african americans in an integrated veterans affairs health care network. *Gastrointestinal Endoscopy*, 80(2), 291-298.
- National Cancer Institute. Surveillance, Epidemiology and End Results Program (2012). Retrieved from <http://seer.cancer.gov/statfacts/html/colorect.html>
- National Center for Health Statistics. *Healthy People 2020 Final Review*. Retrieved from <https://www.healthypeople.gov/2020/Leading-Health-Indicators>

National Center for Veterans Analysis and Statistics, 2016 Profile of Veterans. Retrieved from <https://www.va.gov>

Oberoi, D. V., Jiwa, M., McManus, A., Hodder, R., & de Nooijer, J. (2016). Help-seeking experiences of men diagnosed with colorectal cancer: A qualitative study. *European Journal of Cancer Care*, 25(1), 27-37.

Pierannunzi C, Hu S, Balluz L. A systematic review of publications assessing reliability and validity of the Behavioral Risk Factor Surveillance system (BRFSS), 2004-2011 2013, 13:49.

U.S. Department of Veteran Affairs. *Vet pop 2014*. Retrieved from [http://www.va.gov/vetdata/Veteran\\_Population.asp](http://www.va.gov/vetdata/Veteran_Population.asp)

U.S. Department of Veteran Affairs. *Vet pop 2016*. Retrieved from [http://www.va.gov/vetdata/Veteran\\_Population.asp](http://www.va.gov/vetdata/Veteran_Population.asp)

U.S. Department of Veteran Affairs. Statistics at a Glance. May 2016. Retrieved from <https://www.va.gov/vetdata/>

U.S. Preventive Services Task Force. Colorectal cancer screening. Retrieved from <http://www.uspreventiveservicetaskforce.org>

Wallace, P & Suzuki, R. (2012). Regional, racial and gender differences in colorectal cancer screening in middle-age african-americans and whites. *Journal of Cancer Education*. 27:703. doi:10.1007/s13187-012-0396-2.

Zubero, M.B., Arana-Arri, E., Pijoan, J.I., Portillo, I., Idigoras, I., Lopez-Urrutia, A., ... Bujanda, L. (2014). Population-based colorectal cancer screening: Comparison of two fecal occult blood test. *Frontiers in Pharmacology*: 4 JAN.

Zullig, L. L., Carpenter, W. R., Provenzale, D., Weinberger, M., Reeve, B. B., & Jackson, G. L. (2013). Examining potential colorectal cancer care disparities in the veterans affairs health

care system. *Journal of Clinical Oncology: Official Journal of the American Society of Clinical Oncology*, 31(28), 3579-3584.

Zullig, L. L., Jackson, G. L., Weinberger, M., Provenzale, D., Reeve, B. B., & Carpenter, W. R. (2013). An examination of racial differences in process and outcome of colorectal cancer care quality among users of the veterans affairs health care system. *Clinical Colorectal Cancer*, 12(4), 255-260.

**Table 1** Summary of Variables and Definitions

<b>Dependent Variables</b>	<b>Theoretical Definition</b>	<b>Operational Definition</b>
Meeting colorectal cancer screening recommendations	Rate of screening test performed by colonoscopy exam, flex sigmoidoscopy or fecal occult test to look for any presence of cancer, in absence of symptoms.	Participants received colorectal cancer screening test performed by colonoscopy exam, flex sigmoidoscopy or fecal occult test according to recommendations. 0= No 1= Yes
<b>Independent Variables</b>	<b>Theoretical Definition</b>	<b>Operational Definition</b>
Age	The length of time that a person has lived.	Age in years 1= Age 50-64 years 2= Age 65-74 years
Gender	As self-identified to interviewer making call to random phone number selected as adult male or adult female of household	1= Male 2= Female
Veteran	A person who has served in the military armed forces and is eligible for care at a VA hospital.	Are you a Veteran? 0= No 1= Yes
Race/ethnicity	The Human Race. All people. Groups based on physical traits, ancestry, genetics or social relationships. A group of people who identify and share a common culture.	1= White/Caucasian 2= Black/African American 3= Hispanic/Latino
Income	Money that an individual receives because of employment.	Annual income reported during BRFSS survey period. 1= Less than \$35,000 2= \$35,000 or more
Educational Level	Highest level of school accomplished.	Highest school grade self-reported in BRFSS 2014 phone survey. 1= Up to Grade 12 or GED (High school graduate) 2= College 1 year to 3 years (Some college or technical school)
Marital Status	A legal civil relationship between two persons.	1= Married/living with partner 2= Single/divorced/widowed/separated/not married